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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/656,221	09/08/2003	Junichi Taguchi	520.36449VX1	1066

20457 7590 12/01/2004

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EXAMINER

AHMED, SAMIR ANWAR

ART UNIT PAPER NUMBER

2623

DATE MAILED: 12/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/656,221

Applicant(s)

TAGUCHI ET AL.

Examiner

Samir A. Ahmed

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE \_\_\_\_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 14-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 14-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☒ Certified copies of the priority documents have been received in Application No. 09/127,960.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |  |
|--|--|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)            |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>9/08/2003</u> . | 6) <input type="checkbox"/> Other: ____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 14-17, 19-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Tsai et al. (U.S. Patent 5,822,055).

As to claim 14, Tsai discloses a method for inspecting foreign matters in or on repeated micro-miniature patterns formed upon a surface of an object to be inspected [pattern defects and particles (col. 6, line 60) on a repeating patterned wafer (col. 9, line 42)], comprising following steps:

obtaining an object image by picking up the image of the micro-miniature pattern, under a bright field illumination, at a coordinate position on the surface of said object to be inspected, which is designated previously [bright field and dark field images from the same point on wafer 14 (object to be inspected) are observed by two different detectors (col. 3, lines 37-40, col. 10, lines 12-15), i.e., bright field image at a coordinate position corresponding to that determined in dark field step is obtained (i.e., coordinate position is previously designated)];

obtaining a reference image by picking up the image of the micro-miniature

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pattern, under a bright field illumination, at an another coordinate position on the surface of said object to be inspected, which is different from but corresponding to said coordinate position mentioned in the above step [data from a similar or reference wafer is obtained for die to die or cell to cell comparison (col.4, lines 64-67), producing at least two independent optical responses (bright field and dark field) from the same area (coordinate position) of the same die of the specimen being inspected, comparison of each of the optical responses with similar (reference) response from the same area of another die of the specimen (col. 11, lines 44-55), i.e., the same area (coordinate position) of another die of the specimen (reference die) is different from but corresponding to the same area (coordinate position) of the die of the specimen being inspected] ;

obtaining an arithmetic processed image between said object image and said reference image [a difference image (arithmetic processed image) is obtained between the image of die of the specimen being inspected and another die (reference die) image (col. 7, lines 33-41), col. 11, lines 44-55]], and

deciding a presence of a foreign matter at the coordinate position on said object to be inspected, which is previously designated, on a basis of a condition of said arithmetic processed image obtained in the above step (col.7, lines 39-53).

As to claim 15, Tsai further discloses, wherein said arithmetic processed image is a difference image between said object image and said reference image [Fig. 5b, subtractor 94 produces a difference image between the image of the die of the specimen being inspected (object image) and a delayed image of another die (reference

Image) under bright field light].

As to claim 16, Tsai further discloses, wherein said arithmetic processed image is a summation image between said object image and said reference image [Fig. 5b shows a difference image, a difference image is a summation image].

As to claim 17, Tsai further discloses, wherein the coordinate position on the surface of said object to be inspected which is designated previously, is a position of existing said foreign matter, which is defined by detecting a scattered light from the surface of the repeated micro-miniature pattern under a dark field when an inspection light is illuminated upon said object to be inspected from a light source [dark field sensor 16' (col. 8, lines 23-27) detects points on the wafer 14 (coordinate position) is identified as being occupied by a defect (col. 5, lines 31-34), scattered light from the surface of the wafer is an inherent characteristic of dark field imaging, where specular areas scatter very little signal back at the detector, resulting in a dark image, hence the term dark field when illuminated by dark field illumination source (col. 8, lines 14-15)].

As to claim 19, Tsai further discloses, wherein said deciding process decides a defect when said difference image obtained is divided into at least two or more images [threshold functions are used to decide defect values when dark field and bright field difference images are subjected to threshold (compared to threshold) (col. 7, line 67- col. 8, line 11) and as shown in Fig. 6, the difference image is divided into two or more images 50, 52, 58, 56 applying the threshold function].

As to claim 20, Tsai further discloses, wherein said deciding process compares said summation image to a predetermined value to decide a defect when at least two or

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more images are obtained as a result of the above comparison [threshold functions (predetermined value) are used to decide defect values when dark field and bright field difference images are subjected to threshold (compared to threshold) (col. 7, line 67- col. 8, line 11) and as shown in Fig. 6, the difference image is divided into two or more images 50, 52, 58, 56 are obtained from the difference image after applying the threshold function].

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai et al. (U.S. Patent 5,822,055) as applied to claim 14 above, and further in view of Addiego (U.S. Patent 5,917,588).

As to claim 18, Tsai further discloses inspecting a repeating pattern wafer (col. 9, line 42), and the same area (coordinate position) of the same die of the specimen being inspected, is compared with each of the optical responses with similar (reference) response from the same area of another die (reference image) of the specimen (col. 11, lines 44-55). Tsai does not specifically, wherein on the surface of said object to be inspected are formed at least two or more of same patterns repeatedly, and the position of said reference image is equal to that of said object image to inspected on the coordinates on each of said at least two or more of patterns.

Addiego discloses a method and apparatus to inspect patterned surfaces of semiconductor wafer (col. 2, lines 54-55), using bright field and dark field illumination. The patterned surface to be inspected as shown in Fig. 7 is formed from at least two or more of same patterns repeatedly (Fig. 4, items R1, R2). Difference image of adjacent reticle fields R1 and R2 is analyzed for defect (col. 8, lines 60-67). The difference images are carried out across all reticle fields 200 (col. 9, lines 50-67). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Addiego's teachings to modify Tsai's method by comparing the same area (coordinate position) of the same die of the specimen being inspected of at least two or more same repeated patterns with each of the optical responses with similar (reference) response from the same area of another die (reference image) of the specimen in order to detect the presence, location and characteristics of anomalies on the patterned surface of a semiconductor wafer, flat panel display, and microchip module for large scale defects.

5. Claims 21-24, 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai et al. (U.S. Patent 5,822,055) as applied to claims 14-17, 19-20 above, and further in view of Yamaguchi et al. (U.S. Patent 4,449,818).

As to claim 21, Tsai does not disclose, further comprising a step for displaying a result of a decision made in the deciding step.

Yamaguchi discloses a method for inspecting defects in the surface of an object where oblique lighting (dark field lighting) is applied to a location to detect a defect property such as dust or residual water drops (first information) (Fig. 12 and Fig. 1) and

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a perpendicular lighting (bright field light) is applied to a location where a defect or foreign substance possibly exists. An image brightness signal under the application of perpendicular lighting (bright field light) is obtained (col. 5, lines 15-27, fig. 13). Shape of the defects are classified by a shape recognition technique from the image obtained from the application of perpendicular lighting (bright field light) (col. 1, lines 57-64) and displayed on a display (Fig. 13, item 14). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Yamaguchi's teachings to modify Tsai's method by using a monitor to display the defect property and shape (decision result) in order to automatically perform the inspection of defects with a high degree of accuracy so that even microscopic defects can be located and not only a constant and reliable inspection in a short time is achieved but also improvement in the quality and yield of products can be expected and eliminate fatigue of the worker's eyes.

As to claims 22-24 and 26-27 refer to claim 21 rejection.

6. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai et al. (U.S. Patent 5,822,055) in view of Addiego (U.S. Patent 5,917,588) as applied to claim 18 above, and further in view of Yamaguchi et al. (U.S. Patent 4,449,818).

As to claim 25, neither Tsai nor Addiego discloses, further comprising a step for displaying a result of a decision made in the deciding step.

Yamaguchi discloses a method for inspecting defects in the surface of an object where oblique lighting (dark field lighting) is applied to a location to detect a defect property such as dust or residual water drops (first information) (Fig. 12 and Fig. 1) and a perpendicular lighting (bright field light) is applied to a location where a defect or

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foreign substance possibly exists. An image brightness signal under the application of perpendicular lighting (bright field light) is obtained (col. 5, lines 15-27, fig. 13). Shape of the defects are classified by a shape recognition technique from the image obtained from the application of perpendicular lighting (bright field light) (col. 1, lines 57-64) and displayed on a display (Fig. 13, item 14). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Yamaguchi's teachings to modify the combined method of Tsai and Addiego by using a monitor to display the defect property and shape (decision result) in order to automatically perform the inspection of defects with a high degree of accuracy so that even microscopic defects can be located and not only a constant and reliable inspection in a short time is achieved but also improvement in the quality and yield of products can be expected and eliminate fatigue of the worker's eyes.

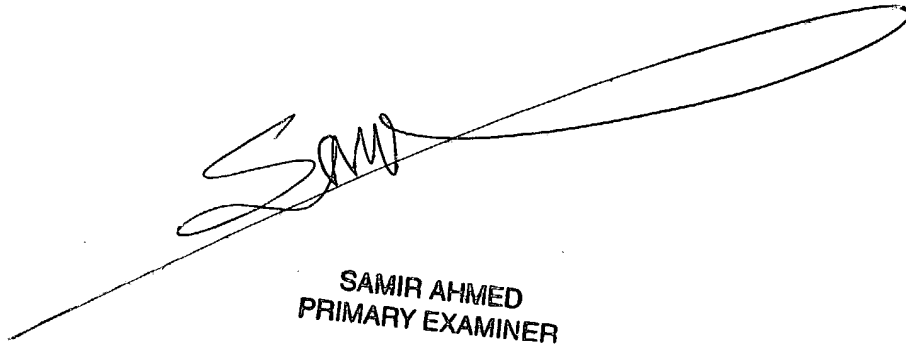
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Samir A. Ahmed whose telephone number is 703-305-9870. The examiner can normally be reached on Mon-Fri 8:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on 703-308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SA



SAMIR AHMED  
PRIMARY EXAMINER